

REMARKS

Reconsideration and allowance of the present application based on the following remarks are respectfully requested.

Claims 1 and 3-5 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. in view of Akahori et al.

Claims 2 and 6-7 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. in view of Kajita et al.

Claims 8-13 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Buchwalter et al. in view of Lui et al.

Claim 14 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Buchwalter et al. in view of Kajita et al.

These grounds of rejection are respectfully traversed. The claimed inventions provide a film formation process and a semiconductor fabrication process resulting in improved adhesion between a barrier conductor layer and a metal layer formed thereon by a CVD process.

The barrier conductor film is exposed to a reducing atmosphere at elevated temperature prior to formation of a metal layer on the barrier conductor film by a CVD process.

Lee et al merely teach the use of a process of exposing a TiN diffusion barrier film to an atmosphere such as N₂ or O₂. The reference does not suggest exposing to a reducing atmosphere.

Akahori merely teaches a process of forming a TiN film by a CVD process and exposing the TiN film to an H₂ reducing atmosphere for reducing chlorine content of the CVD-Tin film. Akahori is silent about formation of a metal film on a barrier conductor film by a CVD process.

Claims 2-7 depend from and further limit claim 1 and are thus deemed patentable over Lee et al or Akahori alone or in combination.

With regard to claim 8, Buchwalter merely teaches the use of a plasma treatment of a thin Cu layer to form an inorganic barrier layer (24) that contains Cu, Si and O. This barrier layer is thus insulative and is totally different from the conductive barrier layer as set forth in claim 8. Thus, Buchwalter appears to be irrelevant to claim 8.

Claim 8 is not suggested by Buchwalter alone or in combination with Liu. Liu merely teaches the use of a TaN or WN barrier. There is no motivation for a person skilled in the art to apply the process of Buchwalter for forming an insulative barrier layer to the process of Liu. The same argument applies also to claim 14.

Thus, claims 8 – 14 patentably define over Buchwalter or Liu either alone or in combination.

As a housekeeping matter, original claim 4 has been split into two claims - claim 4 and claim 16 to improve English word usage.

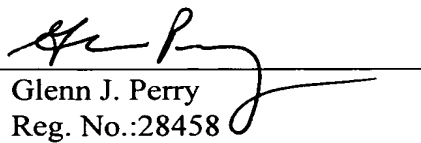
In view of the foregoing, the claims are now believed to be in form for allowance, and such action is hereby solicited. If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, please contact the undersigned at the telephone number listed below.

Attached is a marked-up version of the changes made to the specification and claims by the current amendment. The attached Appendix is captioned **“Version with markings to show changes made”**.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in a condition for allowance and a Notice to that effect is earnestly solicited.

Respectfully submitted,
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Enclosure: Appendix

APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

2. (Amended) A method as claimed in claim 1, wherein said first reducing gas atmosphere is selected from [any of] the group consisting of : silane, ammonia and hydrogen.

4. (Amended) A method as claimed in claim 1, wherein said second reducing gas atmosphere [is selected from any or more of] includes hydrogen [and nitrogen].

End of Appendix

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